REMARKS

Claims 22-30, 43, 53, and 56-68 are currently pending. Claims 1-21, 31-42, 44-52, and 54-55 have been withdrawn previously. Claims 22, 29, 30, 53, 56, 63, 64, and 66 have been amended for clarity. Support for the changes to claims 29 and 63 can be found in FIG. 6 and the text related thereto. Claims 30 and 64 have been amended to improve readability. Applicants respectfully request reconsideration of the application in response to the final Office Action.

Claim Rejections – 35 U.S.C. §103(a)

Claims 22-30, 43, 53, 56-65, and 66-68 have been rejected under 35 U.S.C. §103(a) as being allegedly unpatentable over Gutmann et al. (Microwave Scanning Microscopy for Planar Structure Diagnostics, 1987, IEEE) in view of Zenhausen et al. (Apertureless near-field optical microscope) and Kraszewski et al. (US 5,039,947).

In rejecting claims 22, 53, and 56, the Office has stated that:

> Gutmann discloses all the elements but silent about the pointed probe tip. Rather, Gutmann discloses a tip, which has a diameter of 1 or 10 mil ...
>
> Zenhausen et al (hereinafter, Zenhausen) in fig. 1 discloses use of a sharp tip in tip/sample interaction for scattered electric field near the tip and to obtain super-resolution image at microwave frequency.
>
> Gutmann and Zenhausen discloses [*sic*] all the elements but are silent about measuring a quality factor and measuring a resonant frequency shift as further claimed. Kraszewski et al. (hereafter Kraszewski) discloses measuring a quality factor and measuring a resonant frequency shift as further claimed [see lines 1-25 of column 3] for nondestructive measurement of the properties of the sample (here the moisture content of individual single grain kernels, seeds, nuts, or fruits.) Kraszewski also discloses measurement of impedance on individual corm kernels with capacitive sensors at radio frequency to determine moisture content (see lines 36-44 of column 1), measure the shift in the resonant frequency and the change in the Q-factor of the cavity to measure microwave and dielectric property of the material (see lines 48-57 of column 1) and a nondestructive process for

> determination of moisture content in a single seeds using a microwave resonator (see lines 58-68 of column 1).
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> Therefore, it would have been obvious to a person having an ordinary skill in the art at the time the invention was made to modify probe tip of the Gutmann and Zenhausen, which offer a sharp tip to obtain better resolution during tip-sample interaction for advantages that Zenhausen [*sic*] has to offer i.e. good predictability over wide range of moisture contents for samples or variable or irregular shape (see lines 50-68 of column 2).

Applicants respectfully disagree. Gutmann discloses two one-port resonant cavities: a micro-strip edge-coupled transmission line resonator with a 1 or 10 mil diameter coupling element; and an aperture-coupled rectangular-wave-guide resonator with an inductive-iris/stripline fed coupling element. The 1 or 10 mil diameter coupling element has a shape of line segment facing the quasi-planar surface of the sample. Likewise, the inductive-iris/stripline has an elongate slit shape oriented toward the surface of the sample. In marked contrast, certain embodiments of the presently claimed invention include a sharpened tip that acts as a point-like evanescent field emitter as well as a detector. Thus, as correctly noticed by the Office, Gutmann is silent as to the probe tip. To overcome the deficiency in teaching the tip, the Office has relied upon Zenhausen. Zenhausen discloses a system that includes an object lens for generating two diffraction limited points at the far surface of a coverslip (i.e., an object to be scanned) and a silicon tip positioned adjacent the far surface. As depicted in FIG. 1 of Zenhausen, a visible light beam is directed by the object lens to the two points, while a portion of light passes through the object to be scanned is scattered by the tip and the scattered light passes through the object again and is collected by the object lens to be analyzed subsequently. As such, the Zenhausen system has little to do with microwave cavity probe, let alone the tip for emitting evanescent electromagnetic field and detecting

the interaction between the sample and the tip. Accordingly, both Gutmann and Zenhausen fail to teach or suggest the tip as defined in claims 22, 53, 56, and 66.

Furthermore, the combination of teachings in Gutmann and Zenhausen is not obvious. The Gutmann system measures the change in resonant frequency due to the reflection of microwave energy by the object during scanning, while the Zenhausen system measures the light that is scattered by a tip and passes through the object during scanning. As such, even if the tip of Zenhausen were installed in the Gutmann system so that the object is disposed between the microwave cavity and the tip, the tip for reflecting visible light would not function properly as a microwave reflector since the microwave energy would be reflected by the object interposed between the cavity and the tip. To state differently, it does not seem logical to install a tip in the Gutmann system in the way Zenhausen teaches as the tip would not function properly in the Gutmann system. Nor would it be obvious how to place the 1 or 10 mil diameter line shaped coupling element of the Gutmann system in the Zenhausen system. The kraszewski is also silent as to the tip for emitting evanescent electromagnetic field. Therefore, if one were to read Gutmann, Zenhausen, and Kraszewski without the benefit of Applicants' own disclosure, one would see that they are incompatible with one another and that there is no reason to modify one to reflect features of the other to arrive at Applicants' claimed invention.

In addition, as correctly noticed by the Office, Gutmann and Zenhausen are silent as to the steps of "measuring a resonant frequency shift of said probe ..." in claims 22, 53 and "measuring a quality factor shift of said probe... " as recited in claims 56, 66. To overcome the deficiency in teaching the steps, the Office has relied upon Kraszewski. Kraszewski discloses a system for measuring moisture

content of grain kernels, seeds, nuts, fruits, or other agricultural produces. Upon inserting the products in the Kraszewski microwave cavity, the shift in resonant frequency or wavelength of the microwave radiation as well as the microwave energy dissipation in the cavity are measured to determine the moisture content. Thus, in the Kraszewski system, the articles to be scanned are inserted in the microwave cavity. In marked contrast, the Gutmann system has a sample positioned outside the microwave cavity and the Zenhausen system is silent as to a microwave cavity. Apparently, the structures and operational mechanisms of the Gutmann and Zenhausen systems are different from those of the Kraszewski system. Thus, it is not clear how to modify the Gutmann and Zenhausen systems so that the sample to be scanned can be inserted in the microwave cavity of the Gutmann system and the steps recited in claims 22, 53, 56, and 66 are performed inside the cavity. Nor would it be logical to modify the Kraszewski system so that the agricultural products can be measured outside the microwave cavity. In sum, if one were to read the cited references without the benefit of Applicants' own disclosure, one would see that they are incompatible with one another and that there is no reason to modify one to reflect features of the other to arrive at Applicants' claimed invention. Only through impermissible and improper hindsight reconstruction has the Office Action been able to pick and choose among isolated disclosures in the prior art in an attempt to arrive at Applicants' claimed invention. It is well settled that such hindsight reconstruction is improper.

For emphasis of the original claim recitations, claims 22, 53, 56, and 66 have been amended. Claims 22 and 56 respectively include recitations "determining said electrical impedance and the distance between said tip and said sample using the

measured resonant frequency shift" and "determining said electrical impedance and the distance between said tip and said sample using the measured quality factor shift." Support for the changes can be found in the specification, at page 19, l. 5-25, for instance. Claims 53 and 66 respectively include recitations "scanning a surface of said sample with said tip to measure resonant frequency shift of said probe ... determining said electrical properties and topography of said sample using the measured resonant frequency shift" and "scanning a surface of said sample with said tip to measure resonant frequency shift of said probe ... determining electrical properties and topography of said sample using the measured quality factor shift." Support for the changes can be found in the specification, at page 17, l. 18 - page 18, l. 5, for instance. To the reading of undersigned, cited references are silent as to the recitations.

In light of the foregoing, Applicants respectfully submit that a *prima facie* case of obviousness has not been established, and claims 22, 53, 56, and 66 are patentable. Claims 23-30, 43, 65, and 67-68 depend from claims 22 and 56, either directly or indirectly, rendering them also patentable for at least the same reasons.

The dependent claims 23-30, 43, and 57-68 will not be separately discussed for sake of brevity. There are some notable differences that are readily apparent. For instance, claims 29 and 63 include a recitation "said tip-sample interaction is measured with a modulated external field in a backing of said sample." To the reading of the undersigned, the cited references are silent to the modulated external field applied to the backing of the sample. For another instance, claims 67 and 68 include a recitation "wherein the measurement is made under quasistatic

approximation conditions." In rejecting claims 67 and 68, the Office has stated that "Gutmann discloses quantitative and qualitative measurements ... quasi-static is inherent to quantitative and qualitative measurements." Applicants respectfully disagree with the asserted legal standard and request evidence to support the assertion.

Claims 22 and 53 have been rejected under 35 C.F.R. §103(a) as being allegedly unpatentable over Amar et al.(Near-field scanning microwave microscope with 100 μm resolution) in view of Zenhausen et al. (Apertureless near-field optical microscope) and Kraszewski et al. (US 5,039,947).

In rejecting claims 22 and 53, the Office has stated that:

> Amar discloses all the elements but silent about the pointed probe tip. Rather, Amar discloses a tip, which has a probe with different diameters to help generate the image of a sample.
> Zenhausen et al (hereinafter, Zenhausen) in fig. 1 discloses use of a sharp tip in tip/sample interaction for scattered electric field near the tip and to obtain super-resolution image at microwave frequency.
> Amar and Zenhausen discloses [*sic*] all the elements but are silent about measuring a quality factor and measuring a resonant frequency shift as further claimed. Kraszewski et al. (hereafter Kraszewski) discloses measuring a quality factor and measuring a resonant frequency shift as further claimed [see lines 1-25 of column 3] for nondestructive measurement of the properties of the sample (here the moisture content of individual single grain kernels, seeds, nuts, or fruits) ...
> Therefore, it would have been obvious to a person having an ordinary skill in the art at the time the invention was made to modify probe tip of the Amar and Zenhausen, which offer a sharp top to obtain better resolution during tip-sample interaction for advantages that Zenhausen [*sic*] has to offer i.e. good predictability over wide range of moisture contents for samples or variable or irregular shape (see lines 50-68 of column 2).

Applicants respectfully disagree. Amar discloses a system that includes a microwave source, a directional coupler coupled to the microwave source, an open-

ended resonant coaxial cable coupled to the directional coupler; and a reflection port coupled to a diode director. In marked contrast, the certain embodiments of the presently claimed invention include a sharpened tip that acts as a point-like evanescent field emitter as well as a detector and extends from a microwave cavity. Thus, as correctly noticed by the Office, Amar is silent as to the probe tip of the certain embodiments. To overcome the deficiency in teaching the tip, the Office has relied upon Zenhausen. As discussed above, the Zenhausen system has little to do with microwave cavity probe, much less the tip for emitting evanescent electromagnetic field and detecting the interaction between the sample and the tip. As such, both Amar and Zenhausen fail to teach or suggest the tip as defined in claims 22 and 53.

Furthermore, the combination of teachings in Amar and Zenhausen is not obvious. The Amar system measures the change in resonant frequency due to the reflection of microwave energy by the object during scanning, while the Zenhausen system measures the visible light that is scattered by a tip and passes through the object during scanning. As such, even if the tip of Zenhausen were installed in the Amar system so that the object is disposed between the microwave cavity and the tip, the tip for reflecting visible light would not function properly as a microwave reflector since the microwave energy would be reflected by the object interposed between the cavity and the tip. To state differently, it does not seem logical to install a tip into the Amar system in the way Zenhausen teaches as the tip would not function properly in the Amar system. Nor would it be obvious how to place the coaxial cable, directional coupler, and reflection port in the Zenhausen system. The kraszewski is also silent as to the tip for emitting evanescent electromagnetic field. Therefore, if one were to

read Amar, Zenhausen, and Kraszewski without the benefit of Applicants' own disclosure, one would see that they are incompatible with one another and that there is no reason to modify one to reflect features of the other to arrive at Applicants' claimed invention.

In addition, as correctly noticed by the Office, Amar and Zenhausen are silent as to the step of "measuring a resonant frequency shift of said probe... " as recited in claims 22 and 53. To overcome the deficiency in teaching the step, the Office has relied upon Kraszewski. As discussed above, in the Kraszewski system, the articles to be scanned are inserted in the microwave cavity. In marked contrast, the Amar system has a sample positioned outside the microwave cavity and the Zenhausen system is silent as to a microwave cavity. Apparently, the structures and operational mechanisms of the Amar and Zenhausen systems are different from those of the Kraszewski system. Thus, it is not clear how to modify the Amar and Zenhausen systems so that the sample to be scanned can be inserted in the microwave cavity in the Amar system and the steps of claims 22 and 53 can be performed inside the cavity. Nor would it be logical to modify the Kraszewski system so that the agricultural products can be measured outside the microwave cavity. In sum, if one were to read the cited references without the benefit of Applicants' own disclosure, one would see that they are incompatible with one another and that there is no reason to modify one to reflect features of the other to arrive at Applicants' claimed invention. Only through impermissible and improper hindsight reconstruction has the Office Action been able to pick and choose among isolated disclosures in the prior art in an attempt to arrive at Applicants' claimed invention. It is well settled that such hindsight reconstruction is improper.

As discussed above, amended claims 22 and 53 include recitations "determining said electrical impedance and the distance between said tip and said sample using the measured resonant frequency shift" and "scanning a surface of said sample with said tip to measure resonant frequency shift of said probe ... determining said electrical properties and topography of said sample using the measured resonant frequency shift." A review of the cited reference reveals that the cited references are silent as to the recitations.

In light of the foregoing, Applicants respectfully submit that a *prima facie* case of obviousness has not been established, and claims 22 and 53 are patentable.

Conclusion

Based on the reasons as set forth above, Applicants respectfully request allowance of all pending claims.

In the event that there are any questions concerning this paper, or the application in general, the Examiner is respectfully urged to telephone Applicants' undersigned representative so that prosecution of the application may be expedited.

Respectfully submitted,

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